

REMARKS

Applicants respectfully request that the above application be reconsidered in view of the above amendments and the following remarks, which are believed to place the application in condition for allowance.

Claims 1, 4-14, and 16-20 are currently pending. Nonelected Claims 21-30 have been canceled without prejudice to prosecuting such claims in a divisional application.

Claims 1 and 14 have been amended to specify that the rotor component subjected to the implanting step is not coated to protect it from oxidation and corrosion, as disclosed in paragraph [0005] of the specification.

Claims 1, 4, 10-14, 16, and 19-20 have been amended to explicitly refer to the rotor component.

Claims 12 and 13 have also been amended to delete the “or maintaining” language.

No new matter is introduced by the above amendments, and it is requested that they be entered.

A. Rejection of Claims 12 and 13 under 35 USC 112

Claims 12 and 13 have been rejected under U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. While Applicants do not agree that the claims are indefinite as written, the claims have been amended to delete the “or maintaining” language, as suggested by the Examiner. Accordingly, withdrawal of this rejection is requested.

B. Rejection of Claims 1, 4-14 and 16-20 under 35 USC 103(a) as being unpatentable over Schaeffer et al. (U.S. 5,780,110) in view of Weimer et al (U.S. 6,532,657 B1), or vice versa

Applicants’ claims specify that the turbine engine rotor component is a compressor disk, a compressor seal element, a turbine disk or a turbine seal element (hereinafter referred to as “disks and seal elements”). As described in paragraph [0004] of the specification, such disks and seal elements are made of nickel-base superalloys selected for good elevated temperature strength and fatigue resistance. However, as noted in paragraph [0005], such disks and seal elements typically have not been coated to protect them against oxidation and corrosion. Various

oxidation-resistant and corrosion-resistant coatings used on turbine blades are generally too thick and heavy for use on disks and seal elements, and may adversely affect fatigue life of disks and seal elements. As amended, Applicants' claims now further specify that the rotor component subjected to the implanting step is not coated to protect it from oxidation and corrosion.

Schaeffer discloses that the adhesion between the bond coat and thermal barrier coating on turbine blades and vanes can be improved by forming an oxide coating at the bond coat/TBC interface. Schaeffer describes surface doping of the bond coat with Fe, Cr or Y using various methods, one of which is ion implantation. Although Schaeffer generally mentions articles and components for use in turbine engines, only blades and vanes (or airfoils) are disclosed. See FIG. 1; Col. 1, lines 14, 20, 35 and 42; Col. 2, line 48; Col. 3, lines 54-55; and Col. 4, line 28. Schaeffer does not disclose turbine engine rotor components (i.e., disks or seal elements) as in the present invention. As noted above, such disks and seal elements typically have not been coated to protect them against oxidation and corrosion. Coatings typically used on turbine blades and vanes, such as disclosed in Schaeffer, generally are too thick and heavy for use on disks and seal elements and may adversely affect fatigue life of disks and seal elements. Schaeffer states in Col. 4, lines 33-40 that the turbine blade of FIG. 1 preferably has a bond coat thickness of 2-4 mils (about 50-100 microns) and a TBC thickness of 5-15 mils (about 125-375 microns). Thus, the total coating thickness on the Schaeffer blades/vanes can be 175-475 microns. In sharp contrast, Applicants' disks and seal elements have a thin oxide coating of from about 0.5 to about 5 microns. See paragraph [0024] of the application and claims 13 and 20. Paragraph [0025] also notes that more complex protective coatings, such as thicker aluminide diffusion coatings or overlay coatings and thermal barrier coatings (such as the coatings used on turbine blades/vanes described in Schaeffer), are often used on portions of turbine engine components having service operating temperatures exceeding 815°C. Thus, Applicants' invention relating to uncoated turbine engine rotor components would not have been obvious to a person of ordinary skill in the art in view of Schaeffer's disclosure of turbine blades and vanes containing bond coats and thermal barrier coatings.

Moreover, in Applicants' invention, the aluminum or chromium ions are implanted into the surface of the rotor component (i.e., the surface of the disk or seal element) (see the last line of Claim 1 and part (b) of Claim 14), not into a bond coat on a turbine blade/vane as in Schaeffer. Schaeffer discloses surface doping of the bond coat to improve adhesion between the

bond coat and the thermal barrier coating. Applicants' disks and seal elements do not have bond coats or thermal barrier coatings for the reasons outlined above. Schaeffer does not disclose surface doping of the blade/vane itself, only the bond coating thereon. Schaeffer nowhere suggests ion implantation of uncoated disks and seal elements, or other turbine engine components that do not have a bond coat and thermal barrier coating.

In view of the above, Claims 1, 4-14 and 16-20 would not have been obvious over Schaeffer, and it is requested that this rejection be withdrawn.

Weimer is cited as disclosing the formation of an oxidized coating on turbine disks and seal elements to protect them from corrosion. However, Weimer does not disclose implanting aluminum or chromium ions into the surface of disks or seal elements prior to forming the oxidized coating, which results in the more stable protective coating of the present invention. In any event, Weimer is disqualified from being used in a rejection under 35 USC 103(a) against the present claims by virtue of the following statement of common ownership.

The present U. S. Patent Application Serial No. 10/634,543 and U. S. Patent 6,532,657 B2 were, at the time the invention of Application Serial No. 10/634,543 was made, owed by General Electric Company.

Accordingly, it is requested that the rejection of Claims 1, 4-14 and 16-20 as obvious over Schaeffer in view of Weimer, or vice versa, be withdrawn.

C. Rejection of Claims 1, 4-14 and 16-20 under 35 USC 103(a) as being unpatentable over Zhao et al (U.S. 6,964,791 B2) in view of Schaeffer et al. (U.S. 5,780,110), and further in view of Weimer et al (U.S. 6,532,657 B1)

As described above, Applicants' claims specify that the turbine engine rotor component is a compressor disk, a compressor seal element, a turbine disk or a turbine seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. Zhao relate to various coatings for turbine engine components, but does not disclose implantation of aluminum or chromium ions into the surface of turbine engine disks and seal elements as claimed herein. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion, and coatings used on blades/vanes are generally too thick and heavy for use on disks and seal elements and may adversely affect their fatigue life. As amended, Applicants' claims now further specify that the rotor component

subjected to the implanting step is not coated to protect it from oxidation and corrosion. Thus, Applicants' invention relating to uncoated turbine engine rotor components would not have been obvious to a person of ordinary skill in the art in view of Zhao's disclosure of various coatings for turbine engine components. In any event, Zhao is disqualified from being used in a rejection under 35 USC 103(a) against the present claims by virtue of the following statement of common ownership.

The present U. S. Patent Application Serial No. 10/634,543 and U. S. Patent 6,964,791 B2 were, at the time the invention of Application Serial No. 10/634,543 was made, owned by General Electric Company.

For the reasons outlined above and regarding the Schaeffer and Weimer references, Claims 1, 4-14 and 16-20 would not have been obvious over Zhao in view of Schaeffer, and further in view of Weimer. Moreover, Zhao and Weimer are disqualified from being used in a rejection under 35 USC 103(a) against the present claims by virtue of the above statements of common ownership. Accordingly, it is requested that the above rejection be withdrawn.

D. Rejection of Claims 1, 4-14 and 16-20 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-29 of Zhao et al (U.S. 6,964,791 B2) in view of Schaeffer et al. (U.S. 5,780,110), and further in view of Weimer et al (U.S. 6,532,657 B1)

To expedite prosecution, submitted herewith is a Terminal Disclaimer over the Zhao and Weimer references which is believed sufficient to remove the obviousness-type double-patenting rejection. The filing of a Terminal Disclaimer simply serves the statutory function of removing the rejection of double patenting and raises neither presumption nor estoppel on the merits of the rejection. *Quad Environmental Technologies v. Union Sanitary District*, 20 U.S.P.Q.2d 1392 (Fed. Cir. 1991). It is therefore submitted that the obviousness-type double patenting rejection has been overcome, and withdrawal of the rejection is respectfully requested.

E. Rejection of Claims 1, 4-14 and 16-20 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3-10 and 12-19 of Weimer et al (U.S. 6,532,657 B1) in view of Schaeffer et al. (U.S. 5,780,110)


To expedite prosecution, submitted herewith is a Terminal Disclaimer over the Weimer reference which is believed sufficient to remove the obviousness-type double-patenting rejection. The filing of a Terminal Disclaimer simply serves the statutory function of removing the rejection of double patenting and raises neither presumption nor estoppel on the merits of the rejection. *Quad Environmental Technologies v. Union Sanitary District*, 20 U.S.P.Q.2d 1392 (Fed. Cir. 1991). It is therefore submitted that the obviousness-type double patenting rejection has been overcome, and withdrawal of the rejection is respectfully requested.

F. Conclusion

It is believed that the above represents a complete response to the Examiner's rejections and places the application in condition for allowance. Accordingly, reconsideration and allowance of Claims 1, 4-14 and 16-20 is respectfully requested.

Applicants would appreciate a telephone call should the Examiner have any questions or comments with respect to this response.

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